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h. All auxillary TM, data recording and redundant command circuitry necessary to insure a "one shot" success was eliminated with no effect on the reliability of the camera.

i. An all titanium drum was used to compensate for the extreme temperature ranges expected (30 degrees F to 85 degrees F).

J. Because this is a fixed focus camera the lens position relative to the film plane was shimmed differently (by adding .005 inch shims) to compensate for the pressure change from 1 x 10 to the minus 2mm to 33.0mm of mercury.

k. Humidity control was not necessary only to the extent of preventing condensation on fast aircraft descents.

l. The aircraft vibration and g-loading was compensated for primarily by the addition of vibration isolators eliminating 98% of the 200-400 cps input from the aircraft and protection from up to 15 g's on the major axis of the aircraft.

m. Pilot control was accomplished by merely interfacing electrically with the Mark II driftsight control with no physical changes necessary on the control box. Use was made of existing lights and aircraft switches.

2. Tests conducted:

a. Thermal test:

During the thermal testing cycle (30 degrees to 140 degrees F) microscopic observations and measurements were taken of the autocollimated image. No focus change or image quality deterioration was detected.

b. Pressure testing:

Atmospheric pressure (1 to 1/100 atmosphere) conditions were introduced to the system. Evaluation was made of this focus and image using the previously described technique. Here again the analysis confirmed the predicted changes (i.e., a linear response to pressure). Additionally, thermal and pressure were jointly introduced in order to observe any inter-reaction. This test also gave no unfavorable results.

c. Vibration and shock:

The camera was subjected to 1g shock and vibrated to 1g from 20-2000 cps for 30 minutes log sweep.

d. System dynamics:

To evaluate the system dynamics and vibration resolution photography was made to establish the resolution standard. The post-resolution photography showed no unaccounted for loss by dynamic vibration.

e. Electrical:

The electrical and mechanical checkouts were made to previously

established levels of acceptance and therefore were considered fully qualified.

f. Photo/Optical:

The photo/optical testing included resolution at high and low contrast levels going through focus, format fogging for banding analysis, and the Dr. A. film flatness test and static through focus runs on the Mann bench and environmental lab simulator.

g. General:

Total camera cycles to achieve the test results were 9300. Successful reliability was experimented in actual flight runs and photographic results proved Itek's analysis on how to adapt this satellite camera to an aircraft. Itek feels that there is no area that can be identified as requiring further attention in order to increase reliability. All mechanical and electrical designs are proven reliable from past history. With the exception of interlocking circuits to protect the camera against vehicle power failure or surges, no changes are required.

3. Thirty Degree Stereo Configuration:

a. The interface of this system into the aircraft is basically the same as the Triple-Prime camera #51. The same changes will be made to this camera system, i.e., modifications to the IMC and scan cams because of the stereo angle and change in [illegible] values. It is mainly a problem of physical interface, but as of 18 November, 90% of the interface is complete. The same procedures will prevail to qualify the camera as noted above. The detail system design on slit widths and cycle rates are a function of operational requirements and can be changed as demonstrated at the option of the pilot and field crews.

b. Through a learning process on the C-Triple Prime Camera #51, improvements on mechanical interface and electrical requirements will be incorporated to simplify field operations.

c. The system can remain on station for a minimum of 50,000 cycles with only normal field crew maintenance with confidence based on past performance of obtaining 100,000 cycles before R and O.

E.TAYLOR

U-2 CAMERAS

SECRET

System	Focal Length	Range	Lateral	Ground Resolution	Scale	ROM Cost	Availability	Remarks
HYCON-B Camera (Framing)	36"	Variable Maximum 3160 NM	Horizon to Horizon	3' 30-35 Lines AVAR	1/23,300	$120,000	Operational	8 Cameras on hand
Improved HYCON-B Camera (Framing)	36"	Variable Maximum 3160 NM	Horizon to Horizon	2.5' 45 Lines AVAR	1/23,300	120,000	Operational	3 Cameras on hand
EASTMAN-KODAK CAMERA (Panoramic)	21"	3740 NM	55	1.25' 110 Lines/MM Low Contrast	1/43,000	950,000	3 Months	3 Cameras Ordered for OXCART. 3 Months time is Required to Configure for U-2 Installation. U-2 Flight Test Completed.
C-Triple Prime (Panoramic)	24"	3,000 NM	17.3	10" 120 Lines/MM	1/35,000	168,000	Prototype Limited Operational	1 Prototype Camera Available with Limited Spares for Limited Operational Use.
Dual C-Triple Prime Convergent Stereo	24"	3,000 NM	17.3	10" 120 Lines/MM	1/35,000	#1-435,000 #2-301,000 #3-200,000 #4-200,000	4 Months	Delivery of Stereo Cameras Scheduled Within 4 Months, ie, February. 4 Cameras now on order.
A-HYCON 333 (Framing)	48"	Variable Maximum 2370 NM	Horizon to Horizon	1' 90 Lines/MM 2-1 Contrast	1/17,500	[redacted]-330,000	First Flight Test - Jan. 1964	New Untested Camera. 3 Cameras on Order for AF This camera will fit U-2 and OXCART Vehicle. Cameras can be delivered 8 Months After Order.

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